What is claimed is:

1. A plasma-processing method comprising the steps of:

mounting a silicon-containing substrate on a mounting unit disposed within a process chamber;

generating plasma through feeding plasma-generating gas including fluorine-containing gas into the process chamber and through causing plasma discharge; and

etching the silicon-containing substrate with the plasma while keeping the silicon-containing substrate at a predetermined temperature of 40°C or higher.

2. The plasma-processing method of claim 1,

wherein the silicon-containing substrate is a silicon wafer having a first side having a protective tape affixed thereon and a second side opposite the first side,

wherein said step of mounting the silicon-containing substrate includes the sub-step of mounting the silicon wafer on the mounting unit while the protective tape contacts with the mounting unit, and

wherein said step of etching the silicon-containing substrate includes the sub-step of etching the second side while the mounting unit is held at the predetermined temperature.

3. The method of claim 2, wherein the second side of the silicon wafer has a stressed layer formed by polishing or grinding, and said step of etching the second side including the sub-step of removing the stressed layer.

4. The method of claim 2, wherein the predetermined temperature is a

temperature not causing the protective tape to exceed a heat resistance temperature of the protective tape.

5. The method of claim 1, wherein the fluorine-containing gas is one of carbon tetrafluoride and sulfur hexafluoride.